

**JP,06-025936,A(1994)**

Search term: H06-25936

## **PATENT ABSTRACTS OF JAPAN**

(11)Publication **06-025936**  
n number :

(43)Date of **01.02.1994**  
publication of  
application :

(51)Int.Cl. **D03D 1/00**  
**A62B 35/00**  
**B60R 22/12**

(21)Applicati **04-176845**  
on number :

(71)Applicant **TOKIN CORP**  
:

(22)Date of **03.07.1992**  
filing :

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(54) **SEAT BELT**

(57)Abstract:

**PURPOSE:** To obtain a seat belt capable of uniformly protecting the human body when an impact is applied thereon, also easy to wear and fix, by sewing a specific shape memory alloy having superelasticity characteristics into a fabric cloth.

**CONSTITUTION:** The seat belt securing the safety of human body can be obtained by sewing, using sewing yarns 2, into a fabric cloth 1 a Ni-Ti-based shape memory alloy 3 having superelasticity characteristics prepared by high- temperature heat treatment of a Ni-Ti-based alloy. This seat belt can uniformly protect human body from impact when such impact like collision is applied on human body and also reduce scars due to outside pressures, etc.

## LEGAL STATUS

[Date of request for examination] 02.06.1999

[Date of sending the examiner's decision of rejection] 15.08.2001

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

## CLAIMS

### **[Claim(s)]**

[Claim 1] The seat belt characterized by having the nickel-Ti system shape memory alloy in which the superelastic property sewn in by predetermined cloth and this predetermined cloth is shown.

### **[Detailed Description of the Invention]**

[0001]

[Industrial Application] This invention relates to the seat belt especially using a shape memory alloy about the seat belt which fixes the body, in order to secure safety.

[0002]

[Description of the Prior Art] Conventionally, since the seat belt with which this kind of body is equipped protects the body and is fixed from impacts, such as a collision, ingredients, such as cloth and strengthening vinyl, are used.

[0003] It is known well that shape memory alloys, such as a nickel-Ti alloy and a Cu-Zn-

aluminum alloy, accompany the reverse transformation of a martensitic transformation, and, on the other hand, show a remarkable shape memory effect.

[0004] Moreover, if it deforms above reverse transformation temperature, stress induction martensite generates said shape memory alloy, and it is also well known in the reverse transformation with release of stress that a lifting and superelastic [ from which a configuration returns spontaneously ] are shown. Even if superelastic [ this ] receives deformation of about 7% to an elongation strain, it returns completely.

[0005]

[Problem(s) to be Solved by the Invention] However, when cloth was used as an ingredient of a seat belt, the difficulty of there being little elasticity of a certain thing, and the force concentrating on some bodies to impacts, such as a collision, and being easy to leave the remains of a crack by pressure to the body had the merit which it is cheap and is easy to use. Furthermore, in case it equips, cloth loosened softly and has also produced faults, such as hanging down.

[0006] Then, the technical technical problem of this invention is offering the seat belt using the superelastic property of protecting the body against impacts, such as a collision, equally and moreover being easy to equip them with it, in view of the above-mentioned fault.

[0007]

[Means for Solving the Problem] According to this invention, the seat belt characterized by having the nickel-Ti system shape memory alloy in which the superelastic property sewn in by predetermined cloth and this predetermined cloth is shown is obtained.

[0008] That is, this invention can offer the seat belt characterized by using the nickel-Ti system shape memory alloy thin band in which the superelastic property sewn in on cloth in the seat belt at the part or all is shown, or a thin line.

[0009]

[Function] A shape memory alloy division nickel-Ti alloy shows superelastic [ which shows unusual elongation to the deformation beyond reverse transformation temperature ].

[0010] Although the stress elongation property of a nickel-Ti alloy is shown in drawing 1, it is saying that superelastic [ which is shown in this drawing 1 ] has the large field which has the deformation mode which does not carry out \*\*\*\*\* dependence in stress if about 1%'s is exceeded by elongation, namely, an ingredient is extended about 5% by the same force.

[0011] Furthermore, if it becomes 5% - about 7%, again, stress will become high with the increment in elongation, and it will depend for it on elongation.

[0012] The deformation mode field independent of this stress is exactly not depending on the size of a wearing part, and irregularity, but carrying out fixed bolting, when it uses for the fixture of said seat belt with which the body is equipped and impacts, such as a collision, are got.

[0013] Moreover, beforehand, superelastic [ of a nickel-Ti alloy ] can also memorize a configuration, and loosens by heat treatment, and \*\*\*\*\* does not have the worries about hanging down etc.

[0014]

[Example] Below, the example of this invention is explained with reference to a drawing.

[0015] First, the alloy of 51at%nickel \*\* Ti is processed in the shape of a ribbon, heat

treatment for 30 minutes is performed at 400 degrees C, and it fabricates in the shape of an accordion.

[0016] This alloy spring carries out a reverse transformation at about 0 degree C.

[0017] Even if lengthened like drawing 2 (b), when a load is removed, the spring of drawing 2 (a) processed in the shape of [ this ] a ribbon returns like drawing 2 (c), and shows superelastic above 0 degree C like drawing 1 .

[0018] The seat belt which it was sewn by cloth and shown in drawing 3 (a) is obtained so that this spring may meet the original form of drawing 2 (a) in the condition of having been lengthened like drawing 2 (b). In drawing 3 (a), 1 is a shape memory spring with which cloth and 2 are put on tuck yarn and 3 is placed between the upper cloth 1 and the lower cloth 1. sewing -- if external force is released in the condition of drawing 3 (a) after the price is completed, this seat belt will become being drawing 3 (b), when the shape memory spring 3 returns.

[0019] The shape memory spring 3 sewn on this cloth is fixed by the dimension according to a seat belt, respectively.

[0020] the seat belt of the example of this invention -- sewing by cloth -- the price is very easy and protects the body to impacts, such as a collision.

[0021] As an alloy used for this invention, a nickel-Ti alloy is the best, and when it heat-treats for 2 hours and nickel heat-treats [ 30 minutes thru/or ] the ingredient of an above-stated alloy presentation for a 50.3 - 51.0at% (atomic ratio) nickel-Ti system alloy according to said conditions at 400 thru/or 500 degrees C after cold working, the reverse transformation temperature of martensite can change the alloy spring into the property of 0 to about 50 degrees C temperature requirement.

[0022] Therefore, a superelastic property can also make the ingredient with which the temperature requirements which show various superelastic properties, such as a 50 degrees C [ 0 to ] thing or a 30 to about 70 degrees C thing, differ.

[0023] A superelastic property is required for the seat belt by this invention in a practical use temperature requirement ( 10 degrees C thru/or 45 degrees C) at least, and it can make easily that with which it equips on clothing, the thing which the skin uses for it, be warm by direct deflection temperature by combine the heat treatment conditions perform between the alloy presentation of an ingredient, 400 degrees C, or 500 degrees C by the purpose of use.

[0024]

[Effect of the Invention] According to this invention as explanation to the above, by using for a seat belt the superelastic property which a nickel-Ti system shape memory alloy has, to impacts, such as a collision, it does not depend on the size irregularity of the wearing part of the body, but fixed bolting is performed, and the seat belt which lessens the remains of a crack by pressure etc. to the body can be offered.

## **TECHNICAL FIELD**

[Industrial Application] This invention relates to the seat belt especially using a shape memory alloy about the seat belt which fixes the body, in order to secure safety.

## **EFFECT OF THE INVENTION**

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## **TECHNICAL PROBLEM**

[Problem(s) to be Solved by the Invention] However, when cloth was used as an ingredient of a seat belt, the difficulty of there being little elasticity of a certain thing, and the force concentrating on some bodies to impacts, such as a collision, and being easy to leave the remains of a crack by pressure to the body had the merit which it is cheap and is easy to use. Furthermore, in case it equips, cloth loosened softly and has also produced faults, such as hanging down.

[0006] Then, the technical technical problem of this invention is offering the seat belt using the superelastic property of protecting the body against impacts, such as a collision, equally and moreover being easy to equip them with it, in view of the above-mentioned fault.

## **MEANS**

[Means for Solving the Problem] According to this invention, the seat belt characterized by having the nickel-Ti system shape memory alloy in which the superelastic property sewn in by predetermined cloth and this predetermined cloth is shown is obtained.

[0008] That is, this invention can offer the seat belt characterized by using the nickel-Ti system shape memory alloy thin band in which the superelastic property sewn in on cloth in the seat belt at the part or all is shown, or a thin line.

## **OPERATION**

[Function] A shape memory alloy division nickel-Ti alloy shows superelastic [ which shows unusual elongation to the deformation beyond reverse transformation temperature ].

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collision, are got.

[0013] Moreover, beforehand, superelastic [ of a nickel-Ti alloy ] can also memorize a configuration, and loosens by heat treatment, and \*\*\*\*\* does not have the worries about hanging down etc.

## **EXAMPLE**

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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The conceptual diagram of the stress-strain curve beyond the reverse transformation temperature of the nickel-Ti alloyed wire used for this invention is shown.

[Drawing 2] The shape memory alloy spring used for this invention is shown. (a) shows the configuration when memorizing and, as for (c), (b) shows the configuration at the time of recovery at the time of deformation.

[Drawing 3] The condition of sewing on cloth the shape memory alloy spring used for this invention is shown. In (a), drawing and (b) show drawing when canceling stress after completion, when sewing and attaching, respectively.

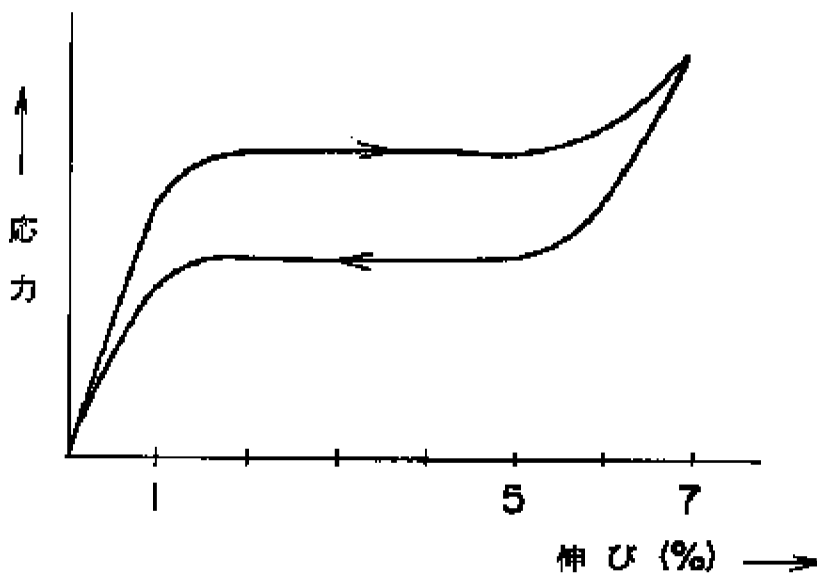
[Description of Notations]

1 Cloth

2 Tuck Yarn

3 Shape Memory Spring Placed between Cloth

Drawing 1



Drawing 2

**(a)**



**(b)**



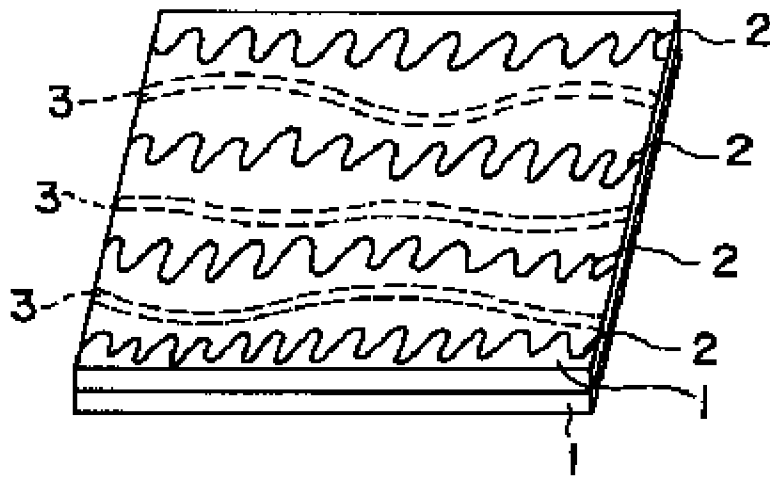
**(c)**





Drawing 3

(a)



(b)

